AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus comprising:

   (a) a memory configured to receive a medical diagnostic image representing a ~~neuro axis~~ neuro-axis of a patient;

   (b) a program stored in the memory and operatively configured to detect and label a plurality of spinal structures in said medical diagnostic image using an iterative process;

   (c) a processor in communication with the memory to perform the program;

   wherein the program is further operatively configured to automatically generate a prescription using said labeling of the plurality of spinal structures.

2. (Original) The apparatus of claim 1 wherein the program is operatively configured to utilize a region growth algorithm to identify a portion of the medical diagnostic image to analyze for the plurality of spinal structures.

3. (Original) The apparatus of claim 1 wherein the program is operatively configured to detect and label a spinal structure based on a landmark, and is further operatively configured to detect and label an additional spinal structure based at least in part on a previously named and detected spinal structure.

4. (Original) The apparatus of claim 1 wherein the program is operatively configured to detect and label the plurality of spinal structures based at least in part on a landmark.

5. (Original) The apparatus of claim 4 wherein the landmark is a top spinal structure.

6. (Original) The apparatus of claim 4 wherein the landmark is a seed.

7. (Original) The apparatus of claim 4 wherein the landmark is automaticlly detected.

8. (Original) The apparatus of claim 1 wherein the medical diagnostic image is comprised of a plurality of voxels, and wherein the program is further operatively configured to:

(a) identify a plurality of voxels in the medical diagnostic image as candidate spinal structures;

(b) apply a spinal structure constraint to identify a series of spinal structures comprising a subset of said candidate spinal structures.

9. (Original) The apparatus of claim 8 wherein the program is further operatively configured to detect a plurality of voxels in the medical diagnostic image as candidate spinal structures by performing a calculation comprising comparing a voxel in the medical diagnostic image with a voxel in a second medical diagnostic image wherein the second medical diagnostic image corresponds to a sagittal section adjacent to a second section corresponding to the medical diagnostic image.

10. (Original) The apparatus of claim 8 wherein the program is further operatively configured to

(a) identify a line defined in part based on a centroid of a candidate spinal structure in the series of spinal structures;

(b) identify an additional spinal structure by searching for a local intensity maximum along a region defined in part by the line.

11. (Original) The apparatus of claim 10 wherein the region defined in part by the line is defined in further part by extending the line based on an estimate of a position for the additional disc.

12. (Original) The apparatus of claim 10 wherein the region defined in part by the line is defined in further part by an additional line, the additional line being parallel to the line.

13. (Currently Amended) The apparatus of claim 1 wherein the medical diagnostic image corresponds to a superior portion of the ~~neuro-axis~~ neuro-axis, and wherein the program is further operatively configured to combine the medical diagnostic image with a second medical diagnostic image corresponding to an inferior portion of the ~~neuro-axis~~ neuro-axis.

14. (Original) The apparatus of claim 1 wherein the program is further operatively configured to analyze a spinal structure from the plurality of spinal structures.

15. (Original) The apparatus of claim 1 wherein the program is further operatively configured to produce a report based at least in part on the naming of the plurality of spinal structures.

16. (Original) The apparatus of claim 1 further comprising a printer operable to produce a labeled visual representation of the medical diagnostic image on film.

17. (Original) The apparatus of claim 1 further comprising a screen operable to display the labeled visual representation of the medical diagnostic image.

18. (Canceled)

19. (Currently Amended) The apparatus of claim [[18]] 1 wherein the prescription is to collect additional medical diagnostic images.

20. (Currently Amended) The apparatus of claim [[18]] 1 wherein the prescription is for a therapeutic procedure.

21. (Currently Amended) The apparatus of claim [[18]] 1 wherein the program is further operatively configured to execute the prescription.

22. (Original) The apparatus of claim 20 wherein the apparatus further comprises a therapeutic instrument and wherein the program is operatively configured to execute the prescription using the therapeutic instrument.

23. (Original) The apparatus of claim 1 wherein the program is further configured to reconstruct a slice by selectively applying a plurality of reconstruction algorithms based at least in part on the detection and labeling of the plurality of spinal structures.

24. (Currently Amended) The apparatus of claim 1 further comprising a screen wherein the program is operable to display a visual representation of the medical diagnostic image using a first contrast and a second contrast, wherein the first contrast is used for portions of the visual representation corresponding with bone and wherein the second contrast is used for portions of the visual ~~representaiton~~ representation corresponding with soft tissue.

25. (Original) The apparatus of claim 24 wherein the first contrast and the second contrast are adjustable.

26-44. (Canceled)

45. (New) An apparatus comprising:

(a) a memory configured to receive a plurality of medical diagnostic images of a patient's neuro-axis;

(b) a program stored in the memory and operatively configured to:

(i) generate a composite midline sagittal image volume of the neuro-axis by combining two or more medical diagnostic images from the plurality of medical diagnostic images, wherein the generated composite midline

sagittal image volume includes at least a portion of all interspaces and vertebrae between the patient's axis (C-2 vertebra) and sacrum; and,

(ii) identify a plurality of spinal structures in the composite midline sagittal image volume by iteratively searching for a predefined search number of spinal structures between the patient's axis (C-2 vertebra) and sacrum, wherein the spinal structures are taken from the set of spinal structures consisting of:

(1) intervertebral discs; and

(2) vertebrae;

and wherein, if the spinal structures are vertebrae, the predefined search number is 22, otherwise, if the spinal structures are intervertebral discs, the predefined search number is 23; and

(iii) determine if a set of predefined criteria are met and, if so, allowing the predefined search number to vary by one;

(c) a processor in communication with the memory to perform the program.

46. (New) The apparatus of claim 45, wherein:

(a) if identifying the plurality of spinal structures in the composite midline sagittal image volume comprises identifying the predefined search number of intervertebral discs, the program stored in memory is operatively configured to, after identifying the plurality of spinal structures:

(i) based on labeling a cephalad disc from the plurality of intervertebral discs as C2-3, consecutively label the remaining discs from the plurality of intervertebral discs in a cranial-caudal fashion as C3-4 through L5-S1; and

(ii) provide vertebrae adjacent to the plurality of discs with corresponding labels: C2 through S1;

(b) if identifying the plurality of spinal structures in the composite midline sagittal image volume comprises identifying the predefined search number of vertebrae, the program stored in memory is operatively configured to, after identifying the plurality of spinal structures:

(i) based on labeling a cephalad vertebra from the plurality of vertebrae as C2, consecutively label the remaining vertebrae from the plurality of vertebrae in a cranial-caudal fashion as C3 through S1; and

(ii) provide intervertebral discs adjacent to the plurality of vertebrae with corresponding labels C2-3 through L5-S1.

47. (New) The apparatus of claim 45, wherein:

(a) identifying the plurality of spinal structures in the composite midline sagittal image volume comprises, based on labeling a top spinal structure, iteratively search for the predefined search number of spinal structures in a cranial-caudal fashion until the predefined search number of spinal structures is identified; and

(b) the program stored in memory is operatively configured to, as each spinal structure is identified, labeling that spinal structure.

48. (New) The apparatus of claim 45, wherein:

(a) the composite midline sagittal image volume comprises the patient's head; and

(b) the program stored in memory is operatively configured to uniquely identify a plurality of head structures in the composite midline sagittal image volume.

49. (New) The apparatus of claim 45, wherein the program stored in memory is operatively configured to perform an automated image analysis at each disc and vertebral level in patient's neuro-axis.

50. (New) The apparatus of claim 45, wherein the program stored in memory is operatively configured to create an optimized reconstruction of a volumetric image dataset of the patient's neuro-axis based at least in part on identification of the plurality of spinal structures in the composite midline sagittal image volume.

51. (New) An apparatus comprising:

(a) a memory configured to receive a CT image data set, the CT image data set corresponding to a portion of a patient's body comprising a first type of tissue and a second type of tissue;

(b) a program stored in the memory and configured to create a medical image from the CT image data set using:

(i) a first reconstruction algorithm, wherein the first reconstruction algorithm is optimized for display of the first type of tissue; and

(ii) a second reconstruction algorithm, wherein the second reconstruction algorith is optimized for display of the second type of tissue;

(c) a processor in communication with the memory to perform the program; and

(d) a display in communication with the processor, wherein the program is configured to cause a composite medical image comprising a portion corresponding to the first type of tissue and a portion corresponding to the second type of tissue to be presented on the display, wherein the portion of the composite medical image corresponding to the first type of tissue is created using the first reconstruction algorithm, wherein the portion of the composite medical image corresponding to the second type of tissue is created using the second reconstruction algorithm.

52. (New) A method comprising:

(a) applying a skin surface marking system to an external surface of a portion of a patient's body selected to be imaged, wherein the system comprises a localizer comprising

(i) a grid; and

(ii) a slice indicator positioned at a 45 degree angle relative to the grid;

(b) imaging the portion of the patient's body and the localizer to obtain a medical diagnostic image, wherein the medical diagnostic image comprises a cross section from the set of cross sections consisting of:

(i) an axial cross section; and

(ii) a sagittal cross section;

(c) determining a location comprising a unique axial location and a unique sagittal location in the medical diagnostic image; and

(d) correlating the determined location in the medical diagnostic image with a location in the patient's body based at least in part on visual observation of the grid from the localizer which had been applied to the external surface of the portion of the patient's body.

53. (New) A method comprising:

(a) acquiring a plurality of medical diagnostic images of a neuro-axis of a patient with rapid sagittal MRI opposed-phase GRE sequences having a total acquisition time of less than one minute, wherein the parameters of the sequences are selected so that discs have the highest signal intensity amongst spinal structures; and

(b) executing a program, which is stored in a computer memory, by a processor for:

(i) generating a composite midline sagittal image volume of the neuro-axis by combining two or more medical diagnostic images from the plurality of medical diagnostic images, wherein the generated composite midline sagittal image volume includes at least a portion of all interspaces and vertebrae between the patient's axis (C-2 vertebra) and sacrum; and,

(ii) automatically identifying a plurality of spinal structures in the composite midline sagittal image volume by executing an algorithm which identifies spinal structures based on signal intensity in the composite midline sagittal image volume.

54. (New) A method comprising:

(a) acquiring a plurality of medical diagnostic images of a neuro-axis of a patient with multi-gradient and spin echo MRI sequencing;

(b) executing a program, which is stored in a computer memory, by a processor for:

(i) generating a composite midline sagittal image volume of the neuro-axis by combining two or more medical diagnostic images from the plurality of medical diagnostic images, wherein the generated composite midline

sagittal image volume includes at least a portion of all interspaces and vertebrae between the patient's axis (C-2 vertebra) and sacrum; and,

(ii) automatically identifying a plurality of spinal structures in the composite midline sagittal image volume using an iterative process; and

(iii) using the identification of the plurality of spinal structures, and at least one parameter map derived from the plurality of medical diagnostic images, automatically assess the patient for at least one neuro-axis pathology.

55. (New) The method of claim 54, wherein the at least one neuro-axis pathology comprises a pathology selected from the list consisting of:

(a) fractures;

(b) osteoporosis;

(c) metastatic disease; and

(d) degenerative disc disease;

and wherein the at least one parameter comprises a parameter map taken from the list consisting of:

(i) a T2 map;

(ii) a T2* map;

(iii) a $T2^{\dagger}$ map;

(iv) a fat map; and

(v) a water map

56. (New) A method comprising:

(a) acquiring a medical diagnostic image of a neuro-axis of a patient with multi-echo MRI sequencing; and

(b) executing a program, which is stored in a computer memory, by a processor, wherein the program is operatively configured to decompose water and fat components of the medical diagnostic image and cause the medical diagnostic image to be presented on a display wherein structures containing only water are displayed in gray scale and structures containing fat in the displayed medical diagnostic image are distinguishable from other aspects based on color.